buses on the main approach roads to Toronto. This was curious since we had seen none at all in this area in 1967 from which we returned to England on 26th August. Had the southward migration started before the 10th September? We could not find out. However, in a year when *plexippus* is found on the south coast of this country in not inconsiderable numbers—and in October—perhaps almost anything can happen.

Lepidoptera in Lapland

By G. Howard

The purpose of these notes is to record some of the Lepidoptera which I have seen in Lapland this year and in so doing perhaps encourage others to visit this vast expanse of moorland, mountain and marsh. In spite of its northerly situation Lapland is fairly easily accessible by road and rail. Unfortunately by virtue of its geographical location, Lapland often seems to get the worst aspects of both maritime and continental types of climate. I have also mentioned a few points of biological interest which are particularly related to Lepidoptera in this area—a tract of country which lies mainly above the Arctic Circle.

In no part of Europe is one so dependent on sunny weather as when collecting Lepidoptera in Lapland. Nearly all who have reported their experiences there have stressed this. The vast majority of day-flying Lepidoptera are only in flight when the sun is shining. Many of them rest when even a thin veil of cloud obscures the sun. One of the exceptions is *Sympistis melaleuca* Thnbg. which I have seen flying in numbers when the sky has been temporarily overcast. The body-temperature of Lepidoptera must reach a certain critical level before flight is possible. It is perhaps surprising that even the relatively slight drop in temperature resulting from thin cloud over the sun, can prevent flight. Both day- and night-flying moths tend to have larger bodies than do butterflies of similar size. They therefore tend to lose heat more slowly than butterflies and this may be one reason why *S. melaleuca* is able to fly during a cloudy spell. Also worth noting in this connection is the fact that *Zygaena exulans vanadis* Dalm. has a lot of hair on its body and this probably results in a decreased rate of heat-loss.

Melanism is some northern species is generally supposed to be an adaptation of low temperatures. *Argynnis improba improbula* Bryk. flies only at a height of about 750-950 metres. The wings, which have a span considerably less than that of other fritillaries occurring in this area, are dark and the wing-pattern appears somewhat blurred. The presence of so much black pigment must result in a relatively rapid uptake of heat. I have seen this butterfly resting on sunny rocks at 900 metres on Nuolja, near Abisko. Before taking flight the wings quiver. This muscular activity causes an increase in body-temperature. One can speculate that similar marked degrees of melanism are not more prevalent in other Lapland fritillaries because interspecific colour differences and patterns must be maintained. At these high latitudes where the density of certain of these species is low, and where the number of sunny hours when flight is possible is limited, it is essential that the males of any species find the females as soon as possible. A further point is that nothing is known of the possible physiological disadvantages which may be associated with

increased melanism in these species. Genes controlling melanism invariably affect other processes as well as the formation of black pigment. I do not believe that any exact estimates of heat-absorption and heat-loss associated with melanism in subarctic Lepidoptera have been carried out. Until this is done only surmise as to the advantages (in terms of heat absorption) that result from different degrees of black pigmentation. This is especially important in view of the tendency for many species of Scandinavian Lepidoptera to show increasing degrees of melanism the higher the altitude.

It is an impression of many who have collected in Lapland that the sunny weather has become progressivly more unstable in recent years. Long periods of sunny days are uncommon and weather forecasts are even less helpful than is the case elsewhere. This year—1968—the winter was very cold and pro'onged. On June 24th there was still a lot of ice on Torneträsk at Abisko. The first butterflies I saw were at Jokkmokk on June 12th. *Callophrys rubi* L. were common together with a few *Argynnis freija* Thnbg. and single specimens of *Pyrgus centaureae* Rbr. and *Isturgia carbonaria* Cl. Five days later at the same locality all these insects were out with *Erebia embla* Thnbg. and *Ematurga atomaria* L. I also took one *Argynnis euphrosyne lapponica* Est. *A. freija* is one of the earliest butterflies to emerge and this date is in contrast to 1966 when, at a higher altitude at Kvikkjokk they were occurring in numbers and in a worn state. The white spots on *P. centaureae* turn yellow in the cyanide jar but later regain their original colour. On June 20th in spite of sunny periods no Lepidoptera were out at Saltaluokta. During the next week the weather was overcast and on a visit to Abisko at the end of the month I saw only one *Gnophos sordaria* Thnbg.—a common insect usually to be seen in numbers in the evening.

On July 1st I returned southwards to Luleå where I took fresh *Argynnis selene* Schiff and *Argynnis eunomia ossianus* Hbst. The following day at Overkalix, *A. euphrosyne lapponica* were flying in a grassy clearing together with *Colias palaeno* L. On July 3rd I stopped by the Pajala-Karesuando road, near Pajala, where *A. euphrosyne lapponica* were common. There was great variation in the quantity of black wing pigment. All gradations occurred and this was clearly not an example of polymorphism. The darkest specimens were strikingly melanic and could be distinguished from the others even in flight. Examples of *A. euphrosyne* from Central and Southern Sweden closely resemble the English form. Ssp. *lapponica* has darker wings and this represents the northern section of a cline extending up through Scandinavia to Northern Lapland. (In the far N.W. of Lapland a lighter, smaller form occurs.) On the same day near Karesuando I took several *Erebia disa* Thnbg. flying over marshy ground.

The next day, July 4th, was the last sunny day I had in Northern Lapland and I am told that it was overcast until about the 17th. I visited Saana which is a limestone mountain situated near the road at Kilpisjärvi. The neighbouring two mountains are also limestone as are others extending in a N.E. direction. *Pieris napi bicolorata* Pet. were common. The females of this northern ssp. have yellow wings with veins heavily dusted with grey. Small numbers of *Colias nastes werandi* Zett. were out and are almost impossible to net when on the wing. *Pyrgus andromedae* Wallengr.

were flying in the same area as *Titanio schrankiana* Hochenw, which is a "micro" and can easily be confused with *Sympistis zetterstedti* Stgr. Neither *S. zetterstedti* nor *Agriades glandon aquilinus* Stgr. had yet emerged but were common at this locality on the same day in 1966. This latter insect is remarkable for its reduced degree of sexual dimorphism. The wings of both sexes are very similar in colour—a somewhat washed-out mixture of brown and blue. These last four insects are mainly confined to one part on Saana where the limestone is mixed with dolomite. All the insects I took this year on Saana were in immaculate condition.

The next days were cloudy and virtually no Lepidoptera were in flight when I continued up to the North coast and back to Karesuando by the road from Alta. On July 8th, near Vitangi, I stopped at a marsh and during a sunny interval caught some *Argynnis freija* in perfect condition, as well as one *Argynnis frigga* Thnbg., *Erebia disa* and *E. pandrose* Esp.

This year I did not see any *Anarta* spp. This group is of particular interest as in Lapland thirteen species are known to occur. Of these perhaps seven can be said to have a mainly subarctic distribution. Any visitor to Lapland will become aware of the similarity of the vegetation, and much of the terrain, with that of the Scottish Highlands. It would seem a strong possibility that one or more *Anarta* spp. remain to be discovered in Scotland. On June 29th 1966 I was fortunate in netting one *Schöyenia* (*Anarta*) *quieta* Hb. near Abisko. (See Entomologist, 1967, 100: 1). This insect had previously been taken only once before in Sweden (also near Abisko) although it has been found on different occasions in North Finland. Abisko is one of the areas in Lapland which has been most often visited by entomologists. The moth is inconspicuous and cannot easily be identified in the field when in flight.

In conclusion a brief mention must be made of *Hyphoraia alpina* Quens. It has been taken in Northern Siberia, Alaska and near Irkutsk. In 1799 one example was taken in Northern Lapland. In July 1962 Prof. Sotavalta caught a male flying on Saana. The following year he found an empty cocoon at the same locality. (For an acount in English see: Ann. Ent. Fenn. 28.4.1962, p. 182-185 and 29.4.1963, p. 254-257.) The next year another empty cocoon was found on a mountain a little east of Saana. Saana has been visited regularly by Finnish entomologists over the last few decades and yet this large tiger-moth had not been seen. At rest it is certainly inconspicuous as the white mottling on the fore-wings must blend well with stone and lichen as a background. The reddish hind-wings are unlikely to be exposed when the insect is at rest. The moth probably flies on the summit plateaus of some mountains in this region. It is probably a day-flier and if its flight-time is short and late in the day it could be easily overlooked. Perhaps the most rewarding approach will prove to be a search for the hibernated larvae in June when the snow is melting.

Although many Finnish collectors visit Finnish Lapland, and a few Swedes go to the Abisko district, the less accessible parts are soldom visited by collectors. One can only hope that the summer weather becomes more settled so that more entomologists feel encouraged to explore this exciting area.

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